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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: SUTHERLAND, Stephen, B.; WICK, Dale, M.
Serial No.: 10/067,961
Filed: February 8, 2002
Title: SYSTEM AND METHOD FOR OPTIMIZING THE STORAGE AND
PROCESSING OF DIGITAL IMAGES ON A DISTRIBUTED
COMPUTER NETWORK
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Transmitted herewith is a certified copy of Canadian Patent Application No. 2,335,385, filed **February 9, 2001**, in the name of **Stephen B. SUTHERLAND and Dale M. WICK**, the foreign priority of which is claimed under 35 U.S.C. § 119, in respect of U.S. Patent Application No. **10/067,961**.

Submission of the certified copy of the above priority document satisfies all of the requirements of 35 U.S.C. § 119. The right of foreign priority should therefore be accorded to the present U.S. application.

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1. Certified Copy Canadian Appln. No. 2,335,385

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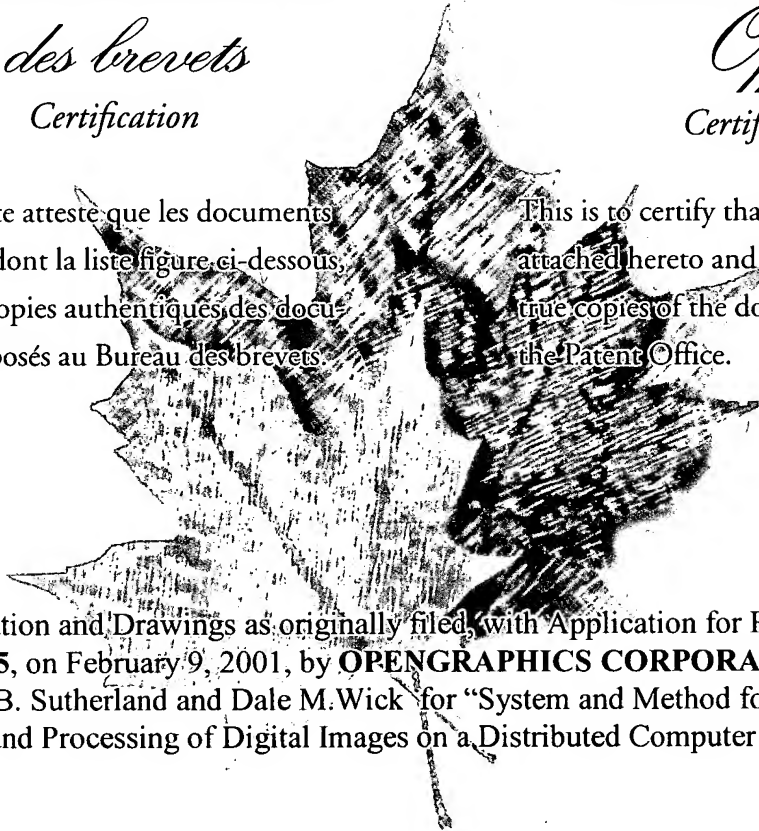
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Specification and Drawings as originally filed, with Application for Patent Serial No:
2,335,385, on February 9, 2001, by **OPENGRAPHICS CORPORATION**, assignee of
Stephen B. Sutherland and Dale M. Wick for "System and Method for Optimizing the
Storage and Processing of Digital Images on a Distributed Computer Network".

Sylvie Grogan
Agent certificateur/Certifying Officer

October 12, 2005

Date

Canada

(CIPO 68)
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ABSTRACT OF THE DISCLOSURE

The present system and method provides for the optimization of the storage, access, processing, and reprint fulfillment of digital images on a distributed computer network. It includes the steps of storing images local to where they were originally scanned and using proxies to minimize required communications bandwidth with a central community photo sharing website while delivering a rich, high-quality enlargement and reprint environment by dynamically transferring the originally scanned images to locations on the network as required.

SYSTEM AND METHOD FOR OPTIMIZING THE STORAGE AND PROCESSING
OF DIGITAL IMAGES ON A DISTRIBUTED COMPUTER NETWORK

FIELD OF THE INVENTION

5 The present invention relates to a method for
effective storage, access, processing and reprint
fulfillment of digital images on a distributed computer
network. In particular, this invention relates to a method
10 which provides efficiencies with respect to communications
bandwidth while delivering both a consistent visual image
access behavior and high-quality reprints.

BACKGROUND OF THE INVENTION

15 The present invention relates to the
optimization of online storage, access, retrieval and
processing of digital images and relating reprint
fulfillment process. More specifically, it addresses the
image quality vs. cost of transmission equation that has
20 been a significant impediment to the sale of enlargements.

 Current high-speed retail digital reprint
systems date back to the initial installations in the early
1990's. One, if not the first of such installations,
25 consisting of a Kodak RFS 2035 Film Scanner, a networked
IBM PS/2 computer and Kodak XLS8300 dye sublimation printer
was installed by "Your Expression Personalized Greetings
Inc." in a retail plaza in downtown Toronto in December
1993. Customers entering the store with film negatives
30 were offered a high-speed, high-resolution (commonly
referred to as "16-base") film scan transferring the image
to the networked computer. Cropping and other editing of
the image then occurred on the computer and the resulting
image was then output on a dye sublimation printer.
35 Optionally, the customer could specify a name for the image
(typically their initials and a frame number) and it would
then be stored on a networked file server. The networked

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file server, running the IBM Lan Server operating system, was attached to remote systems through a dial-up telephone line but since the 16-base image was 18MB in size, rarely was the original image transferred without first being significantly compressed, typically using JPEG, resulting in quality loss. Thus, subsequent prints made from the transferred image were inferior to the first reprint made at time of scan.

As the internet emerged and demands for the transmission of digital images grew, common approaches to the image size vs. transmission time equation appeared. One approach, popularized by Kodak's "PhotoNet" online service, was not only to significantly JPEG compress the images before transmission, but to also significantly reduce the target original image size before compression by creating only low resolution (commonly referred to as "4-base") scans. This meant that one entire roll of scanned negatives in the PhotoNet system could be transferred over the internet in far less time than one of the original scans made by the Your Expression system.

While there is little or no visual difference to consumers in a heavily compressed 4-base image and an original 16-base image when viewed onscreen and reprinted at sizes such as 4x6 and 5x7 inches, larger reprints and cropping operations make the compressed 4-base images inadequate. As photofinishing retailers face little (if any) profit margin on small reprints, a method is needed whereby the quality benefits of 16-base scans can be achieved using existing, affordable network bandwidth.

SUMMARY OF THE INVENTION

The system and method of the present invention provides the user with full information and records with sufficient accuracy to place an order. Once an order is received, the full digital record is retrieved and if

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necessary, transmitted to an appropriate site to allow the order to be processed. In this way, only full records for which an order has been received, are transmitted and in many cases, the records may already be present with the particular premise where the full record is maintained.

The method of the present invention includes the steps of storing original film scans on a local file server and transferring proxies of such images to a central photo sharing community website, together with a pointer to the original file server; allowing an authorized user to access the community website and the particular images associated with the user and providing tools for the user to modify and adjust the images and when desired; place an order with respect to an adjusted image together with the instructions set of the modifications that have been made to the image; providing said instruction order set to the original file server; modifying the original image using the instructions provided with the order information to produce a high quality image as ordered by the user and providing the image to the customer.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention are shown in the drawings, wherein:

Figure 1 is a schematic overview showing a community website, a series of users and a series of related retail outlets; and

Figure 2 is a schematic showing certain features of the community website.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

With the present arrangement as shown in Figure 1, there can be a series of retail outlets 8 and each retail outlet 8 can include its own associated file server 10 on which full images are loaded and stored. Proxies of

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these images (reduced accuracy) are posted to the community website 4. Any user 2 can access the community website 4 and review the images and prepare modifications thereof and place an order of such images, with any of the retail outlets 8. If the order is placed with the retail outlet that originally stored the full image, then that outlet can process the full image and produce the ordered product for the customer. In some cases, the customer may have designated a different retail outlet. In this case, the original image is transmitted from the first file server to the file server of the designated retail outlet. This outlet then completes the order and provides the finished product for the customer. In some cases, the retail outlets may merely send the finished product to the selected outlet using conventional means.

With this system and method, transmission of full images, i.e., 16 base images, is minimized, and at least, limited to the fulfillment of orders. Proxies of the fully scanned images are provided to a community website with much less quality than the original image, however, the quality is sufficient for the customer to view the images over a computer network. The image, when viewed on a computer monitor, will be of the same approximate quality, whether the image is a four base image or a 16 base image. Therefore, if a customer has 36 digital images scanned and posted to the community website, these posted images will all be of reduced quality, i.e., 4 base images. The customer may seek to modify one or two of these images and can determine what modifications, enlargements and cropping, etc. that may be desired on the community website and view the modified 4 base image, in accordance with his instructions. He can then place an order for that modified image for pick up at a retail outlet.

35

The instructions with respect to the modified image are transferred to the retail outlet and the retail outlet will either retrieve the 16 base image from its own

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database or have it transmitted from one of its associated retail outlets. In this way, the 16 base images are only transmitted when an order is received and only a small number of the images will actually be transmitted. This system provides the full advantages of basically free viewing and editing by the user, and encouragement of additional orders which are typically at a higher margin. The cost of offering this service are greatly reduced as the memory storage and transmission costs are less demanding due to the significant reduction in the quality of the image available to the user. This is basically transparent to the user as he is viewing these images, using a monitor where this reduction is not immediately apparent.

15

In a preferred aspect of the invention, certain customers can have enhanced services and can have enhanced images transmitted to the website for modification. This might be necessary where a very small portion of an image is to be considered for enlargement and the quality of the image on the web server would not be sufficient. These instructions can be transmitted to the original file server and only that portion of the image, which is to be enlarged, need be transmitted to the web server at the standard for the web server (i.e., four base image). Again, the transmission costs are reduced and the desired image of the customer is provided to him at a quality which is appropriate for the viewing technique. This service could include a certain fee or charge.

25
30

A further opportunity for increased profit margin for retailers is in the sale of higher-resolution scans. Existing systems categorize all customers, and all images, in one group and do not recognize that the proliferation of knowledge of digital imaging is creating groups of customers who would pay for better quality film scans. Existing systems also do not recognize that some images are more valuable to such customers than others.

35

Thus a system allowing for the dynamic categorization of images and customers based on their quality desires is required. No retailer wants to transfer high-resolution scans to a central photo sharing website just to find that the customer then deletes the majority of images - thus for cost issues, retailers today simple transfer lower-resolution, or heavily compressed, images and do not give customers the choice of better quality online options.

A further related area of this invention includes the ability to crop, edit and use images in compositions for final output through the manipulation of a lower-resolution "proxy" of the original image. Object-based procedures, such as described in "Method of Rendering an Image" US patent #5903277, make this possible and negate the need to have a high-resolution original online for editing, composting and cropping operations and this invention integrates the use of such capabilities. Furthermore, existing web-based systems which attempt to build complex compositions centrally requiring fine fonts or other detail are often faced with producing files of over 30MB in size which have to be transmitted, with only lossless compression, to print fulfilling locations. This invention distributes the final processing of such compositions to the fulfilling locations and thus negates the need to move final compositions long distances needlessly consuming communications resources.

The overall system shown in Figure 1 has a number of users 2 that access using the internet or other available network the storage website 4. This storage website has received from one of the various retail outlets 8, reduced quality digital records such as digital photographs which have been stored in accordance with information with respect to the user. The user can then access these digital records and review them in a reduced quality which is satisfactory for review and transmission over the internet. The web storage site 4 also allows the

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user to modify these images, crop them, mosaic them, and a host of other tools, and preview the possible product.

Basically the user is allowed free access to allow
5 a host of different modifications with the possibility of a further sale for the modified image. The finished product will not use the quality of the images stored on the storage website 4 as these were of reduced accuracy
suitable for transmission over a network and for display by
10 user. If the user decides to proceed with an enlargement, for example, which has been cropped and possibly colour corrected, an order is placed, together with the instructions with respect to the cropping, and perhaps even the modified 4 base image. The user will also designate
15 which retail outlet he would like to attend at or have complete the service completed on his behalf.

In many cases, this will be the same store that he originally took his film to for developing or scanning, and
20 thus, the store will have in its own 16 base storage indicated as 10, the actual detailed record. In this case, that store would then complete the order on behalf of the user and the user would pay that retail outlet. With this arrangement, transmission of the detailed record across the
25 network has not occurred and only the simplified images were transmitted to the storage website. This greatly reduces the complexity with respect to the storage website 4 and also greatly reduces transmission time and cost.

30 In some cases, the user may wish to pick up his order at a different retail outlet than the outlet that originally converted his film records to 16 base digital records. Therefore, instructions may come to store 3 whereas the actual detailed record is at the file server at
35 store 1. Store 3 would then provide instructions to store 1 with respect to transmission of the actual digital record required to allow the order to be completed, and store 1 would transmit this record to store 3. Once again, only

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transmission of the required digital record is made across the network and as can be appreciated, many of the 16 base digital records will never be transmitted across the network. Furthermore, transmission of the detailed record
5 across the network is only based on an order being placed, and therefore, the transmission costs can be built into the pricing model.

With this system, the convenience and encouragement
10 is provided for the user to view his images and modify the images, using the storage website 4. This enhancement is accomplished in a cost effective manner and any reduction in quality is basically transparent to the user. As can be appreciated, the user will be reviewing these records on a
15 monitor and the 4 base digital records will be sufficient. Furthermore, the user places an order based on the modified 4 base image and as such, the final product when it is received will be more accurate and of higher quality.

20 The storage website 4 can also have associated therewith, a long term storage or storage which is paid for by a user. For example, a user may review 36 4 based images corresponding to his film that he has dropped off at store 1. Of these 36 images, he has determined that four
25 of them are excellent records and although he does not wish to order them at this time, he does wish to pay for storage on a long term basis. These 4 high quality records can be transferred to the website.

30 The present system and method facilitates the online ordering, processing and production of high-quality enlargements from high-resolution (or losslessly compressed 4-base) images without incurring significant incremental transmission costs; allows customers who wish to pay for
35 high-quality film scans and relating products the ability to do so without incurring significant costs for the retailer against all customer film scanning; and allows customers, who discover after their film has been developed

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and scanned, that one or more specific images are those "once in a lifetime moments" that should be preserved in a higher-resolution form.

5 1) The customer's account is entered into a scanning station where film frames are then scanned and the resulting images are transferred to a locally networked file server. Should the customer not have an existing account with the retailer, a number of methods of
10 assigning an account may be used including customer's phone number, name, etc., which are not critical to the invention. Typically, these scanning stations will be scanning at 16-base or higher resolution and typically a lossless or near lossless compression is the only
15 compression applied to such images before storage on the locally networked file server.

2) Each image is given a unique identifier automatically by the scanning station (this may consist of
20 the time and date of the scan with a reference to the customer account, or retail location or in other manners such that every image has a unique identifier.

3) Code running on the locally networked file
25 server produces image proxies from each stored scanned image and automatically transfers each proxy to a specialized central internet photo sharing community web site. These proxies are of adequate resolution and quality for screen display, typically 400x400 pixels as
30 they are never intended for reprint purposes. Transferred proxies are tagged with appropriate customer account information and are placed in an incoming album in the account of the customer, all without any further manual intervention from the retailer.

35 4) When the customer accesses an account over the internet, the central internet photo sharing community web site then displays the image proxies and is designed to

support alburning and other common online operations plus proxy editing, cropping and compositions using the proxies rather than the original images. In the preferred embodiment, the central website converts all such operations (the "image processing" operations) to postscript where possible.

5) When a reprint is ordered, any image processing operations are sent with a unique reference to the originally scanned image (or images, if more than one image is used in a composition) to a print server at the print fulfilling location along with corresponding order identification and processing information.

6) Should the print fulfilling location be the same location where the film was originally scanned, the originally scanned image will already be local to the print server but if the fulfilling location is different from that where the original scan was made, the print server at the fulfilling location will automatically fetch the original image from the original scanning location.

7) Now having the image processing operations and the original image (or images), the print server executes the processing operations against the original image(s) and produces the highest-possible quality enlargement or reprint. Note that communications bandwidth is only consumed by the transfer of the high-resolution images where a reprint has been ordered - and not by the transfer of all original scans as is the case with existing internet photofinishing systems linking with photo community sharing websites. Note also that although this method refers to reprints and enlargements, it is applicable to all photographic products like mugs, calendars, mousepads, photo-greeting cards, etc.

8) The originally scanned images will be automatically deleted over time as the local file servers

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manage their storage in conjunction with the central internet photo sharing community web site which will give customer viewing images time to decide if such customer wishes to pay for longer term, higher-security storage or other options for the original film scans. For example, 30 days prior to the flush of a given set of original scans, a customer could be offered individually priced packages to store all, or selected images for varying periods. Such payment would then offset the communication cost of moving the original scans to the central web site. Facilities at the central web site would then typically offer increased redundancy including options for optical backup and off-site storage.

9) Customers might also opt to combine a series of original scans onto one CD, ordered according to their desires, not according to frame number. The production of such CDs would then require the gathering of all original scans from various distributed local file servers but such communication cost for those specific images would be offset by the revenue from the sale of such CD. Should any image processing operations have been applied to the proxies, such would also be applied to the original images before writing to CD.

10) Customers who have special, "premium" online accounts might be offered special pan and zoom or other functionality requiring dynamic access to the original film scanned images and in such event, to meet this requirement, either the original image would be dynamically transferred to servers at the central internet photo sharing community site for appropriate retransmission to such customer, or such function would be provided directly by the file server holding the original image.

11) It is also supported within this invention that a customer of a given scanning location would be able to

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order enlargements and other photographic products at the time of scanning which may not necessarily be fulfillable at the given scanning location. For example, the scanning location may have a digital minilab capable of only 4x6 output but the customer wishes 5x7's. In this case, the scanning location's file server could dynamically generate a print fulfillment request at any remote print server which would then fetch the original images from the scanning file server when such remote print server had available bandwidth and was queuing 5x7 print jobs.

Although various preferred embodiments of the present invention have been described herein in detail, it will be appreciated by those skilled in the art, that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

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THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A system which stores original film scans on local file servers and transfers proxies of such images to a central photo sharing community website.
2. A system in claim 1 where customers accessing the central photo sharing community website can crop, edit and make compositions using the proxies online in such a fashion that it is transparent to them that they are not accessing their originals.
3. A system as in claim 2 where unique references to the original film scanned images and the cropping, editing and composition operations are then transferred to the original film scanning location (or to any third location) which combines these operations, at the point of fulfillment, with the original film scanned images (fetched, as required from the original film scanning location) to produce high quality enlargements, reprints, and other photographic products.
4. A system as in claim 1 where the proxies are sequenced and such sequence is then transferred to a CD fulfilling location where the original film scanned images are assembled and burned to CD in the order of the sequence of the proxies.
5. A system as in claim 2 where the cropping editing and composition operations are applied to proxies which are then sequenced by the customer and then transferred to a CD fulfilling location which combines these cropping, editing, and composition operations with the original film scanned images and then writes the resulting images to the CD in the sequence specified by the customer.

6. A system as in claim 4 which instead of writing the images to a CD, the fulfilling location sequences the images for an internet slide presentation.
7. A system as in claim 5 which instead of writing the images to a CD, the fulfilling location sequences the images for an internet slide presentation.
8. A system which allows customers, after a series of image proxies have been uploaded to their online photo sharing account, to select one or more images and indicate that they desire that the original film scanned image be stored for an extended period allowing them to order high-quality enlargements, CDs and other products at any time in such future period without image degradation.
9. A system which allows retailers to offer image scanning and print fulfillment in a seamlessly networked environment where any scanning location could automatically cause remote print fulfilling locations to perform its desired fulfillment tasks.
10. A system comprising a series of local servers which stores digital images at a high quality, and a web server which receives reduced quality copies of said digital images and makes said images available to users over the internet; said web server allowing users to modify said digital images and order copies thereof produced from said high quality images, said web server upon receipt of order instructions sending instructions to any of said local servers to produce said order for transfer to said user by modifying said high quality images as specified by the user.
11. A method of storing, accessing, modifying and printing digital photographic comprising storing digital records in a high quality form on a local file server,

producing a substantially lower quality copy of said digital records and transmitting to and posting on a website for access by an authorized user, providing on said website tools for modifying any of said images, recording of user instructions with respect to a modified image which he wants reproduced on a charge basis, forwarding said instructions to a retail outlet, retrieving corresponding high quality records associated with said instructions, and producing at said retail outlet said modified image using said high quality records and said instructions.

12. A method as claimed in claim 11 wherein said step of transmitting said lower quality record is transmitted over the internet to said web server.

13. A method as claimed in claim 11 wherein said local file server cooperates with other local file servers and transfers high quality records to any local server which has received instructions to produce a modified image.

14. A method as claimed in claim 11 including maintaining said records on said local file server only for a limited time unless instructions for long term storage are received.

15. A method as claimed in claim 11 wherein said step of producing said modified image prints said image.

16. A method as claimed in claim 11 wherein said step of producing said modified image stores said modified image on a compact disk.

17. A method as claimed in claim 11 wherein said step of producing said modified image stores said modified image on a storage medium specified by the user.

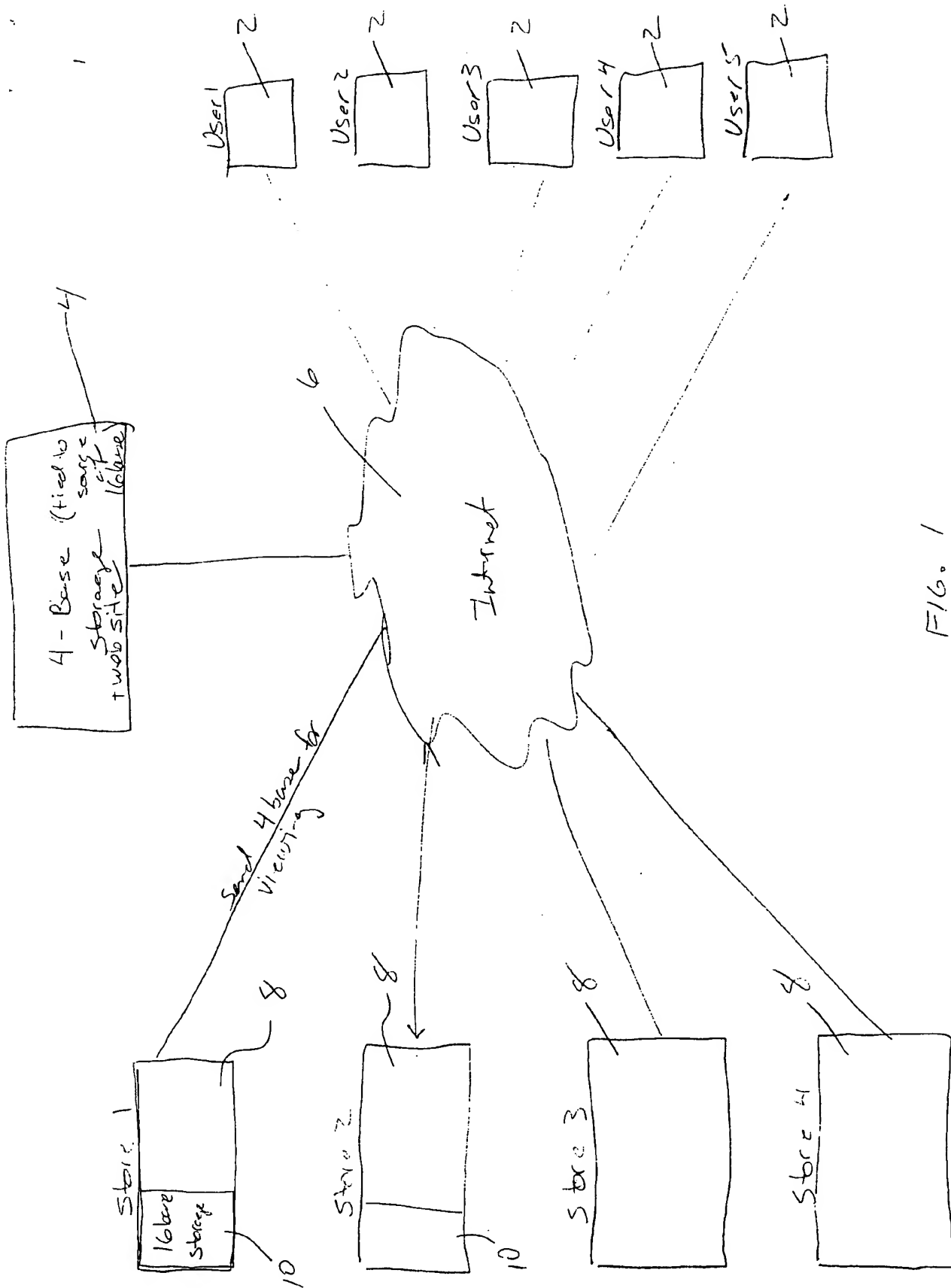


FIG. 1

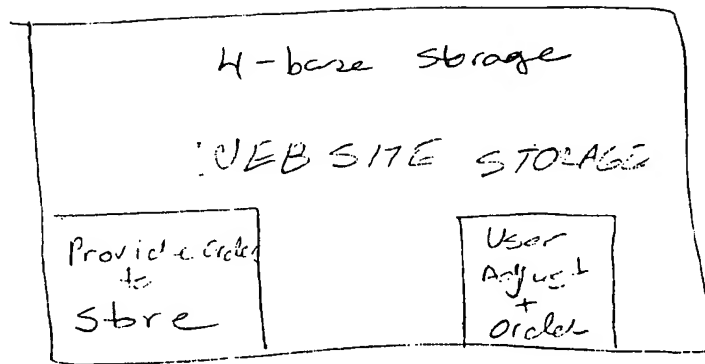


FIG. 2

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